

election cycle, James says she realized that many federal lawmakers begin their political careers at the state level. With this knowledge, she decided to focus her efforts on educating her local Colorado legislators about biomedical research.

After enlisting the support of Senator Johnson, a member of the Colorado Senate Education Committee, whose office secured a location and invited fellow legislators, James invited colleagues from the University of Colorado, Colorado State University, and the University of Northern Colorado to join her in giving presentations.

The overall response from attendees was very positive. Senator Nancy Todd remarked, "It was great to have several experts come to the capitol and share with legislators the valuable work that is making a difference in the overall health of our citizens. Learning about infectious and emerging diseases that threaten the well-being of each one of us is imperative for us to then share

with our constituents. The discussion on immunizations continues to need to be based on fact, not scare tactics. With these experts on hand, we are able to back our opinions with factual information that is based on research."

This response was exactly what James had hoped to achieve. "Not only do our state lawmakers have an increased appreciation for biomedical research, but they also have scientists they can contact with questions about research when making policy decisions. Hopefully, sessions like this are a good beginning and can be replicated in other states." James has already been invited to repeat this session next year in Colorado.

AAI members who are interested in coordinating a similar session in their state are welcome to contact James at sjames001@regis.edu.

**Testimony of Clifford V. Harding, M.D., Ph.D., on behalf of  
The American Association of Immunologists (AAI),  
Submitted to the House Appropriations Subcommittee on Labor, Health and Human Services,  
Education, and Related Agencies,  
Regarding the Fiscal Year (FY) 2016 Budget for the National Institutes of Health  
April 27, 2015**

The American Association of Immunologists (AAI), the world's largest professional society of research scientists and physicians who study the immune system, respectfully submits this testimony regarding fiscal year (FY) 2016 appropriations for the National Institutes of Health (NIH). **AAI recommends an appropriation of at least \$32 billion for NIH for FY 2016** to fund important ongoing research, strengthen the biomedical research enterprise, and ensure that the most talented scientists, trainees, and students are able to pursue careers in biomedical research in the United States.

**NIH's Essential Role in Advancing Biomedical Research**

As the nation's main funding agency for biomedical and behavioral research, NIH supports the work of "more than 300,000 researchers at more than 2,500 universities, medical schools, and other research institutions in every state and around the world."<sup>1</sup> More than 80% of the NIH budget is awarded to these scientists through nearly 50,000 competitive grants; about 10% of the NIH budget supports the work of the almost 6,000 government researchers who work in NIH laboratories or at the NIH Clinical Center.<sup>2</sup> NIH funding is a vitally important economic engine in the communities and states where these researchers work; in FY 2012, NIH funded research supported an estimated 402,000 jobs across the United States.<sup>3</sup> NIH also provides crucial scientific leadership to the entire biomedical research enterprise, both within and beyond our borders. Advancing basic research from bench to bedside requires extensive collaboration among scientists from academia, government,<sup>4</sup> and industry; all depend on NIH personnel and policies to guide and facilitate their efforts in this enormous, complicated, and high-stakes endeavor. In fact, the biotechnology and pharmaceutical industries rely heavily on NIH's investment in basic biomedical research; it is often this research that industry uses or further explores to develop new drugs and medical devices.<sup>5</sup>

## **Erosion of NIH Budget Slows Research and Threatens U.S. Preeminence**

Although NIH funds most biomedical research in the United States, its purchasing power has been dramatically reduced by inadequate budgets that have been further eroded by inflation.<sup>6</sup> In FY 2015, NIH's purchasing power is 22% lower than it was in FY 2003.<sup>7</sup> This reduced purchasing power enables NIH to fund only ~ 16.8% of grant applications submitted, a steep decline from the ~32.4% it funded when its budget was robust.<sup>8</sup> This loss is not only a barrier to advancing crucially important research, it is also devastating to those who are currently engaged in - or considering - a career in biomedical research. Researchers around the country are closing labs and losing jobs; in some cases, they are moving overseas, where support for biomedical research is rapidly growing.<sup>9</sup> Many who do stay in the U.S. are engaged in an unrelenting and time consuming search for funding, when they should be conducting research and mentoring the nation's future researchers, doctors, inventors and innovators. Most importantly of all, we will never know what research has not been pursued - or how many potential treatments and cures have not been discovered - because of inadequate funding.

## **The Immune System: Essential to our Health, Crucial to our Future**

As the body's primary defense against viruses, bacteria, and parasites, the immune system protects its host from a wide range of diseases and disorders. When it is operating properly, the immune system can provide powerful protection against many illnesses, including cancer, Alzheimer's disease, and cardiovascular disease. When it underperforms, it can leave the body vulnerable to infections, such as influenza, HIV/AIDS, tuberculosis, malaria, and the common cold. The immune system can also become overactive and attack normal organs and tissues, causing autoimmune diseases including allergy, asthma, inflammatory bowel disease, lupus, multiple sclerosis, rheumatoid arthritis, and type 1 diabetes. Immunologists are on the front lines, therefore, working to harness the immune system to protect people and animals from chronic and acute diseases and disorders, as well as from natural or man-made infectious organisms (including Ebola, plague, smallpox and anthrax) that could be used for bioterrorism.

## **Recent Immunological Advances: Providing Hope for Today - and Tomorrow**

### ***1. Cancer Immunotherapies: Real Results in the Fight Against Cancer***

Lauded by *Science* magazine in 2013 as "The Science Breakthrough of the Year," the genetic engineering of a cancer patient's T cells (immune cells) to kill the patient's own cancer cells, a procedure known as immunotherapy, continues to advance.<sup>10</sup> At NIH funded medical centers, scientists and doctors are observing a significant regression of blood cancers (non-solid tumors) in both children and adults.<sup>11</sup> This therapy, which the FDA granted Breakthrough Therapy designation in July 2014 (which can expedite approval of a therapeutic based on clear clinical efficacy), is poised to be used for even more difficult-to-treat solid tumor cancers, and is helping to inform ongoing clinical trials in breast, lung, prostate and brain cancer.<sup>12</sup> The success of these therapies has also attracted the investment of pharmaceutical companies and has led to the development of several new T cell therapy-focused biotechnology companies, illustrating how investment in NIH funded research creates opportunity - and jobs - in the private sector.

### ***2. Ebola Outbreak: Finding a Vaccine to Save Lives***

The 2014 Ebola virus outbreak in West Africa, the largest in recorded history, spread rapidly due to a lack of public health infrastructure, prophylactics, and therapeutics. Like many such diseases which have historically low rates of infection, Ebola had not attracted commercial interest. However, ongoing research by federal agencies, including NIH, provided a sufficient foundation for the development of several vaccine candidates, two of which are now being administered through clinical trials in the outbreak region and showing promising results.<sup>13</sup> Although pharmaceutical companies are now involved in manufacturing vaccines and other potential therapies, it is the federal investment in research that has made possible a rapid response to this urgent health crisis.<sup>14</sup> Because we do not know what infectious disease might emerge next, it is crucial that the federal government continue to fund basic biomedical research to ensure our ability to respond quickly, particularly when the public health benefit outweighs the potential commercial benefit.

### **3. A New Way to Stop HIV ... and Other Infections and Diseases?**

Researchers have recently discovered that Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR) systems - immune mechanisms used by bacteria to defend themselves from virus infection - present a novel therapeutic tool for immunologists, enabling them to successfully disrupt HIV replication, stop the growth of human cervical cancer cells and kill antibiotic-resistant bacteria.<sup>15</sup> Immunologists are also exploring the use of CRISPR to repair defective genes in stem cells, which may treat individuals with diseases like sickle cell anemia and immune deficiencies.<sup>16</sup>

### **4. New Therapeutic Provides Real Hope for Autoimmune Treatment**

In January 2015, the FDA approved the first of a new and highly effective class of treatments for psoriasis, a serious autoimmune skin disease.<sup>17</sup> The new treatment inhibits IL-17 signaling, a process which initiates inflammation and which was first discovered by NIH funded researchers in 2005.<sup>18</sup> This treatment has proven effective in Phase II clinical trials, with more than 70% of psoriasis patients showing over 75% clearance of disease, and nearly half showing 100% clearance of disease.<sup>19</sup> Clinical trials targeting similar aspects of this pathway are yielding promising results and may offer hope to those suffering from other autoimmune diseases, including ankylosing spondylitis and rheumatoid arthritis.<sup>20</sup>

## **Conclusion**

AAI appreciates the subcommittee's strong support for NIH and for ensuring a robust biomedical research enterprise in the United States, and recommends an appropriation of *at least \$32 billion* for NIH in FY 2016.

1. <http://www.nih.gov/about/budget.htm>. NIH funds also support the work of non-scientist technical personnel.
2. Ibid.
3. <http://nih.gov/about/impact/economy.htm>.
4. AAI strongly opposes a federal policy that limits government scientists' ability to attend privately sponsored scientific meetings and conferences ([http://www.hhs.gov/travel/travelpolicy/2012\\_policy\\_manual.pdf](http://www.hhs.gov/travel/travelpolicy/2012_policy_manual.pdf)) and believes that "the rules have... made government scientists feel cut off from the rest of the scientific community, wreaked havoc with their ability to fulfill professional commitments, and undermined the morale of some of the government's finest minds." *Testimony (Amended) of Lauren G. Gross, J.D., on behalf of The American Association of Immunologists (AAI), Submitted to the Senate Homeland Security and Governmental Affairs Committee for the Hearing Record of January 14, 2014: "Examining Conference and Travel Spending Across the Federal Government"* ([http://aai.org/Public\\_Affairs/Docs/2014/AAI\\_Testimony\\_to\\_Senate\\_HSGAC\\_01142014.pdf](http://aai.org/Public_Affairs/Docs/2014/AAI_Testimony_to_Senate_HSGAC_01142014.pdf)).
5. "[NIH] ... annual research funding... is the most important source of discoveries in the health sciences that ultimately leads to the development of important new therapeutics ...." Statement of Roger Perlmutter, Ph.D., Executive Vice President, Research & Development, Amgen, June 15, 2005 <http://www.rdmag.com/articles/2005/06/managing-rapid-biotech-growth>.
6. Federation of American Societies for Experimental Biology, Funding Trends, 2015. <http://www.faseb.org/Portals/2/PDFs/opa/2015/2.10.15%20NIH%20Funding%20Cuts%202-pager.pdf?pdf=2.10.15%20NIH%20Funding%20Cuts%202-pager>.
7. Johnson, Judith A., "NIH Funding: FY1994-FY2016," Congressional Research Service, R43341, pp. 2-3 (2015). Measured in constant 2012 dollars. Excludes funding from the American Recovery and Reinvestment Act (ARRA).
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9. Moses, H., et al. The Anatomy of Medical Research: US and International Comparisons. *JAMA* 313, 174-189 (2015). According to Moses et al., while U.S. funding for biomedical and health services research increased at a rate of 6 percent per year from 1994-2004, it decreased to just 0.8 percent annually from 2004-2012.
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12. Kakarla, S. & Gottschalk, S. CART Cells for Solid Tumors: Armed and Ready to Go? *Cancer J.* 20, 151-155 (2014)
13. See <http://www.niaid.nih.gov/news/newsreleases/2015/Pages/PREVAILphase2.aspx>.
14. Wong, G., et al. Intranasal immunization with an adenovirus vaccine protects guinea pigs from Ebola virus transmission by infected animals. *Antiviral Res.* 116, 17-19 (2015); Stanley, D. A. et al. Chimpanzee adenovirus vaccine generates acute and durable protective immunity against ebolavirus challenge. *Nat. Med.* 20, 1126-1129 (2014).
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17. See <http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm430969.htm>.
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19. Gaffen, S. L., et al., The IL-23-IL-17 immune axis: from mechanisms to therapeutic testing. *Nat. Rev. Immunol.* 14, 585-600 (2014).
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## A A I   P R E S I D E N T ' S   M E S S A G E



**Dan R. Littman, M.D., Ph.D.  
AAI '87**

AAI President, July 2015–  
June 2016

*HHMI Investigator and Helen  
L. and Martin S. Kimmel  
Professor of Molecular  
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I feel privileged and grateful to have the opportunity to serve as President of The American Association of Immunologists (AAI) during the 2015-2016 year. I am particularly fortunate to take on this position at a time when the study of immunology is more exciting than ever and provides ever-growing prospects for clinical benefit.

My first exposure to immunology was as an undergraduate, when I became fascinated by the big questions of how antibody diversity is generated, how T cells recognize antigen, and how immune tolerance is achieved. Even though we now have a deep understanding of these fundamental problems, many new questions continue to arise, particularly as it has become evident that functions of the immune system are critical in numerous chronic human diseases. The intersection of immunology with a growing number of disciplines guarantees that there will be many fascinating challenges for the next generation of talented young investigators to explore. The AAI will play an increasingly important role in helping to raise awareness of the importance of such research and ensure there is sustained funding for it. I hope you will join me in supporting the AAI in this important work.

When I was elected to the AAI Council five years ago, our community was already well into a process of self-examination. After the retrenchment in federal spending that followed the NIH budget doubling, our priorities needed to account for an influx of new postdoctoral fellows and a shift to emphasizing consortia and large center grants. There has been an erosion of roughly 22 percent in real dollars since the 2003 peak in the NIH budget, leading to a reduced emphasis on investigator-initiated grants and funding of basic science in general, as well as to a surfeit of talented and experienced young investigators competing for a limited number of research positions. Our junior faculty devote too much of their time to

writing grants rather than at the bench and directly imparting their knowledge to their trainees. Many of our colleagues are facing staff reductions or even the closing of their laboratories despite their active contributions to advancing our understanding of the immune system. Several prominent investigators have chosen to accept positions abroad, motivated by more predictable funding. Fortunately, these problems are receiving increased federal attention, and there are hopeful signs that our legislators are responding by considering bills such as the “21st Century Cures Act” (which would significantly increase the NIH budget and provide more funding for both high-risk, high-reward research and early stage investigators) and the “Accelerating Biomedical Research Act” (which would allow for significant annual increases in NIH funding).

Each of my predecessors has highlighted this deepening crisis in our research infrastructure, and, as a result, the AAI has responded in an exemplary way, providing fellowships, travel grants, and educational opportunities that have had a major impact on our research community. This response was made possible by the wise leadership of the AAI by Executive Director Michele Hogan and her associates, and by my predecessors on the AAI Council, who helped institute novel programs to support investigators and promote educational programs for students and postdocs. The AAI can further contribute by reaching out to our membership for creative approaches to ensure that funding is sustained and that scarce resources are leveraged to foster high quality research. We must recognize that there are changes in how science is being done and that there is an opportunity for the AAI to provide further leadership to help maximize the ability of our members to contribute in the years ahead. This is clearest in the area of “omics” technologies, where spectacular advances during the past decade have brought all biomedical scientists up against a big data wall that most of us are unequipped to scale. This is especially true in the field of immunology. We are particularly fortunate to be able to study disease-related problems at both the cellular and organismal level, and the pace of data accumulation is astonishing. The new generation of immunologists will need training in “big data” to enable them to ask the relevant questions and develop or adopt the tools most appropriate to answer them. The AAI can play a significant role in making recommendations on the training of students and postdoctoral fellows, exploring ways to foster literacy in computational biology and transformative technologies, and helping ensure broader access to these technologies for AAI members.

Our AAI Committee on Public Affairs, working with Lauren Gross, the director of public policy and government affairs, has done an outstanding job of reaching out to legislators to emphasize the importance of funding immunology research. We have made impressive and sometimes unexpected advances that we can present as evidence that our research makes a big difference. (Who would have predicted that immune system modulation would become the most attractive option for the treatment of cancers? Harnessing of host immunity to destroy cancer cells was viewed with almost universal skepticism.) We have the opportunity to contribute to a deeper understanding of many chronic human diseases now appreciated as being immune-mediated, and we must communicate this to the lay public, our representatives in government, and the administrative leaders of our institutions. We must, in particular, emphasize that the therapeutic breakthroughs that have made immune system modulation the hottest area in the pharmaceutical industry were brought about by advances in basic science laboratories. Although “personalized medicine” will clearly transform the

practice of medicine in the years ahead, the NIH’s increasing emphasis on translational research, which has heavily influenced the leadership at the research institutions that most of us inhabit, can result in distorted priorities. One of my goals during the coming year will be to further emphasize the importance of fundamental discovery research, while also highlighting the need to train the new generation of scientists in the tools that will allow them to apply new knowledge to human biology. We must also enlist the support of the biotech and pharmaceutical industry sectors in advocating for sustained biomedical research funding, as their success is dependent on our continued contributions.

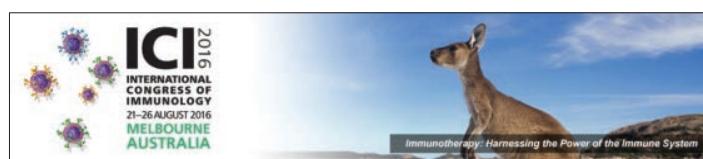
I am enthusiastic and optimistic as I undertake this year of service to the AAI. I hope that you will join me in conveying this sense of possibility to those whom we encounter every day and help spread the message that immunological research is an endeavor that will increasingly touch more and more lives—and, hence, deserves universal support.

## AAI to Offer Members \$1 Million in Travel Grants for 16th International Congress of Immunology in Australia

AAI is pleased to announce that it will award up to \$1,000,000 in travel grants to AAI members for the

16th International Congress of Immunology (16th ICI), to be held August 21-26, 2016, in Melbourne, Australia.

Grant application will be open to investigators of all career stages. To be eligible, an applicant must be an AAI Trainee, Associate, or Regular member in



good standing for 2015 and 2016, and an author on an abstract submitted to the 16th ICI. Preference will be

given to applicants with no more than \$250,000 in total research funding from all sources (excluding PI salary).

Complete eligibility and application instructions will be posted to the AAI website in January 2016.

Visit the 16th ICI website at <http://ici2016.org>.

